The Defense Logistics Enterprise: Transforming Organizations in the Information Era

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I. Objectives

The objectives of this document are 1) to set forth the vision, mission, and goals of the Department of Defense's current efforts to modernize its logistics business processes and related information systems, 2) to provide a basic introduction to the concepts of enterprise integration, supply chain management, and lean processes as fundamental to logistics modernization, and to the information systems that support these approaches, 3) to explain why organizational transformation is required as an integral component of the logistics modernization process, and 4) to describe some fundamental principles, methodologies, and tools of organizational change management that are available to individual programs as a means to support logistics modernization . A glossary is provided as an appendix that defines all terms marked in ***bold italics***.

II. Vision and Mission

The Department of Defense ***logistics enterprise*** exists to support the Warfighter's need for materiel and information – the right stuff at the right place and the right time, whatever, whenever, and wherever! Our nation's security, as well as each individual soldier's life, depends upon this critical mission being fulfilled accurately on an hourly and daily basis, around the clock, 365 days a year. There is nothing more critical than the supply of material and information to the Warfighter – battles and entire wars throughout history have been won and lost based on delivery of these key requirements.

In alignment with the top priorities of the US Secretary of Defense, *we will provide responsive and cost-effective support to ensure readiness and sustainability for the total force across the spectrum of military operations. Through this mission, military logistics will be transformed through implementation of key strategic initiatives based on today's leading business practices, and through management of key performance metrics.* Our vision and mission are to enable and improve our core logistics business processes (i.e., supply, maintenance, distribution) to provide the optimal levels of efficiency and effectiveness while we assemble and deploy a truly integrated information and knowledge environment.

Our logistics business processes must be both efficient and effective. We must utilize resources efficiently so that our nation's defense enterprise strengthens and never weakens the United States economically. Cost savings can be re-invested in new weapons systems development to create a stronger future force. To ensure optimal effectiveness, we must seize the most powerful technologies available to drive our logistics business processes, and abandon technological pathways that are antiquated or have proven obsolete.

We are committed to meeting Warfighter requirements around the clock, and around the globe, through ***enterprise integration***, ***end-to-end customer service, and lean processes***. These approaches are complementary and mutually reinforcing. The integration of the logistics enterprise means that materiel and information flow more efficiently across different functional and organizational units, reducing the friction created by organizational boundaries. At its core, the integrated environment supports and enables the military mission by providing rapid, efficient, flexible, and economic logistics support. . End-to-end customer service provides materiel, including retrograde and associated information, from the source of supply to the point of use or disposal as defined by the CINC, Military Service, or characteristics of the commodity, on a worldwide basis. This includes acquisition, sourcing, positioning, and transportation to facilitate the flow of materiel to the end user. It recognizes that deployment and distribution processes need to be synchronized. Lean processes strengthen the efficiency and effectiveness of the logistics enterprise by eliminating non-value added activity and defects (i.e., waste), and thereby streamlining business processes to improve customer service from end to end.

Some of the benefits that will result from the modernized environment include:

- Reduced order cycle times;
- Eliminated business process redundancies and streamlined organizations;
- Optimal inventory levels and material requirements; and
- Increased visibility over materiel flow and production processes.

Implementation of the modernized environment will transform logistics business processes end-to-end, resulting in substantial performance improvements. Data and information exist as an enterprise asset, where they are continually updated to ensure that information is always authoritative, available, and up-to-date. In addition to integrated, real-time information to support the Warfighter, authoritative sources of information permit the generation of metrics, such as those listed below, which help gauge and improve the overall performance of the logistics enterprise.

Sample Metrics Hierarchy

The Warfighter
Force Closure
    Transportation Closure by ULN
    Closed by RDD
Force Readiness
    Operational Availability for Critical Systems
    % of Critical Systems Equipment on Hand

Resource & Capability Planning/Budgetary/Risk
Logistics Chain Predictability
    Production/Delivery Flexibility
    Planning & Re-planning Cycle Time
Logistics Chain Affordability

Logistics Chain Expense

Logistics Process Execution and Materiel Execution
Force Sustainment
Logistics Chain Reliability
Logistics Chain Effectiveness
Perfect Order Fulfillment (On time delivery)
Order Fulfillment Lead Time or Total Pipeline Time

Creating an efficient environment across the DoD logistics enterprise will include aspects of collaboration, standardization, and integration to ensure that the information and value chains support the overall DoD enterprise (including Acquisition, Comptroller, etc.) at the optimum levels. This will improve reporting, both internally and externally, of key metrics, through the implementation of consistent business rules and requirements across the enterprise. Higher levels of integration are possible because timely, accurate and actionable information about the logistics enterprise is available in a consistent manner.

Available advanced information technology will accelerate our ability to realize the logistics enterprise vision. We can use information to reduce customer wait time in the logistics supply chain, and therefore increase the operational availability of weapons systems. We also can optimize the total inventory we maintain and reduce the 'footprint' we deploy to forward operating locations. Modern ***commercial off-the-shelf (COTS)*** software will enable the DoD to implement the best processes that allow collaborative support of operational forces[1].

To meet this commitment, the Department of Defense must transform its business processes, the associated information systems supporting them, and the organizations in which they reside. Moreover, we must carefully manage this change within our organizations in order to assure that we achieve the vision for the entire defense logistics enterprise and for our country.

III. Statement of the Problem

Our present situation creates many challenges with respect to the vision set forth above. A principle feature of this situation is the nature of the Department of Defense's current logistics operations, which have evolved to become a set of multiple, overlapping functional stovepipes. While "Second to None" operationally, these stovepipes are frequently slow, inefficient, inflexible, and uneconomic. The interactions between the DoD, DoD customers, and partners are characterized by paper-based transactions and by

[1] Extensive research supports the use of COTS with a single system integrator that minimizes unique code and employs a continuous improvement strategy. Reasons for using COTS cited by companies include: 1) total life cycle costs vs. in-house developments or complex system integration; 2) time to deploy; 3) reduction of risk; 4) realization that modern COTS packages are based on the vendor's knowledge of the very best business practices and processes, gleaned from working with many world class companies. COTS vendors also belong to standardization groups that are involved in on-going research, with development of metrics that have been refined by the Supply Chain Management Council.

batch-processed transactions that are created and re-created in a sequential chain. While these systems and business processes and their associated transactions served well in the past, they have not been updated to leverage today's enterprise-based information technology.

Today, our 20-30 year old processes and systems are considered antiquated. Logistics business processes were not designed initially for optimal end-to-end efficiency, but instead are fragmented as a consequence of the multiple overlapping stovepipes in which they are embedded. Each stovepipe has its own traditional ways of doing business, and these often involve inefficient, non-value added tasks and activities that slow down the flow of materiel and information to the Warfighter. When no one owns the process overall, there is a lack of focus on the customer – the Warfighter. Information systems, in turn, have been configured to mirror and support these fragmented processes. Even at their best in the past, these systems relied on constant monitoring and human intervention. System redundancy has proliferated, resulting in multiple systems doing essentially the same thing, modified slightly here and there, customized to individual needs, wants, and desires. The result is over 600 logistics systems and approximately 400 million lines of code – all of which must be sustained and maintained. In most cases, the government developed these systems to meet the specific functional needs of a relatively small group of users. Too often, we store our information in specific silos, or stovepipes, which are not ***interoperable***. As a result, their user base is often extremely limited, resulting in high cost per user. Often we are tied to a single contractor for support and maintenance. We spend large sums on the care and feeding of our logistics systems that remain susceptible to errors and delays – these cannot be tolerated as we move to more agile and lethal forces. In short, many of our logistics information systems are outdated and inefficient, making customer interaction difficult, slow, and expensive. Further, these fragmented and internally-oriented systems do not provide an enterprise-wide focus to permit decision-making at the DoD level, nor do they facilitate collaboration with customers and suppliers.

Another critical issue is that stovepiped DoD logistics business processes and systems are ineffective in that they do not provide authoritative, real time, up-to-date, end-to-end information required by today's Warfighters. Critical Warfighter information is maintained in batch processed systems in functional or commodity stovepipes, with multiple stand-alone databases requiring multiple data entry steps for a single transaction. All of this increases the risk of inaccuracy, as well as data format and definition inconsistencies. It is difficult, if not impossible, for operational staffs to access authoritative information needed to fully understand the total impact of the logistics situation on overall Warfighting operations.

In addition, legacy information management systems are not designed to accommodate advanced technology such as data compression, local and wide area networks, automatic identification technology, one-time source data, and client-server configurations; no single application information system can retrieve information from several data storage sites to anticipate force projection requirements, identify locations of available assets, and synchronize the movement and distribution of resources and information. What all of

this means is that technological advances ironically leave our defense logistics information systems even farther behind.

The bottom line is that our vision of providing *responsive and cost-effective support to ensure readiness and sustainability for the total force across the spectrum of military operations* – our promise to the Warfighter -- is severely challenged by our present logistics business processes and information systems. Transformation is urgently needed.

IV. 21st Century Defense Logistics Requirements

The logistical demand of agile, joint task forces provides the driving imperative for a fundamentally different approach to our logistics business processes. The idea of distribution versus supply-based logistics – the right stuff at the right place and the right time *versus* forward deployed inventory buffers -- capitalizes on the synergy of dominant maneuver and precision strike to replace force mass with force effect. Such distribution-based processes rely on the synergy of information supremacy and distribution agility to replace logistics mass with logistics velocity. This is an integral part of the Joint Chief's 'focused logistics' – the fusion of information, logistics, and transportation technology to provide rapid crisis response, track and shift assets even while en route, and deliver tailored logistics packages and sustainment directly to strategic, operational, and tactical levels of joint operations. The constraints of focused investment in 'right sized' inventories of materiel, the need to reduce the deploying force 'footprint', and a focus on the creation of combat capabilities that can be employed to meet current threats, will drive the structure of logistics business processes now and in the future.

In this environment, the combat commander – the ***CINCs*** and the Warfighter community – as the ultimate customer of our logistics business processes, must have timely, accurate, and actionable information. In this new environment, Warfighters must have high levels of confidence in the reliability of logistics processes to capture emerging patterns of demand and translate those demands into the right materiel in the right place at the right time. In such an environment, superior logistics capability is synonymous with an integrated view of the ongoing logistics functions across the entire defense enterprise, a view created by the deployment of enterprise information technology; i.e., information systems that can provide an enterprise-wide view of the logistics landscape.

The future DoD logistics enterprise vision mandates a fundamentally different way of looking at the logistics business architecture. Logistics functions will be viewed and managed as a supply chain with end-to-end processes focused on producing capabilities for the Warfighter across a range of activity domains. In the enterprise view of DoD logistics, we need a ***supply chain management*** approach in which activities are organized into end-to-end processes that work together to meet military needs.

To meet the Warfighter's needs for materiel at the right place and the right time, it is essential that we have information systems that are integrated at the DoD enterprise level to provide near real time, accurate, and actionable data/information/knowledge about the Warfighter's logistics situation. Further, we need information systems that will affect the

needed flow of materiel with a minimum of human intervention. Business operations must be ***network centric***, or 'net-centric' – meaning that a Warfighter requirement or other support requirement (whether human or automatically generated) is known at once by all potential sources. The systems architecture (i.e., relationships among information systems supporting the required functionality at the enterprise level) responds as one to the requirement, providing near real-time feedback to the customer that creates or validates an expectation of service, offering actionable options if the full requirement will not be met.

The requirement is to provide the Warfighter community with improved ***interoperability*** and materiel readiness through logistics ***enterprise integration*** and modernized logistics systems. This will result in reduced cost, improved quality, improved responsiveness to the customer (the Warfighter), improved trading partner flexibility, and optimal benefit from our capital assets.

V. Private Sector Solutions

While the Government has experienced serious logistics challenges, private industry has at the same time undergone a logistics revolution. Using innovative methods of strategic planning, business process re-engineering, and enabling information and communications technology, American companies began to establish themselves as world leaders in the business area of logistics. They have made business process breakthroughs by taking full advantage of the explosion of network-based tools, applications, and capabilities that share information globally. The new information environments have created the notion of information as a strategic asset as the baseline for future information systems architecture. This transition to ***network-centric*** thinking has been adopted universally as the paradigm for global business operations for the 21st century. These advances have consistently been on the DoD's 'to do' list. Examples of logistics processes based on distribution and not supply are total asset visibility, single network systems based on intranets, extranets, electronic commerce, and electronic data interchange. Others include cross-docking, order and shipping time of 2-5 days, single integrated point of sale systems, in-transit visibility with redirection capability in route, use of satellite-based communications for asset tracking, global data integration and access, and many others that are in use and producing outstanding results in private industry. All of these have been difficult for the DoD to implement, due to technological, organizational, and related constraints.

A concept key to industry's achievements is that of ***supply chain management***. This encompasses all business practices associated with moving goods from the raw material stage to the end user. The supply chain includes sourcing and acquisition, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. It also embodies the information systems to monitor all activities. Supply chain leaders are Xerox, IBM, Chrysler, Nabisco, and P&G, among others. Supply chain management means reduction in inventory, infrastructure, transaction, accounting, and transportation costs. Supply chain management has led to such benefits as on-time delivery, inventory reduction, cumulative cycle time reduction, reduction in

out of stock rates and real time processing and records costs. Supply chain management has resulted in 50% inventory reductions, 40% increases in on-time deliveries, 27% decreases in cumulative cycle time, and nine-fold reductions in out-of-stock rates. An enterprise-wide approach is made possible by the infusion of enabling technology, an effective benchmark for challenges facing the DoD.

The private sector also has transformed the way we think about workflow. In the past, businesses organized work around Adam Smith's division of labor, with a focus on functional tasks and activities that were structured vertically, inside organizational silos. But a new emphasis on customers and markets has led to a revolutionary shift toward a focus on processes that are structured horizontally, and cut across multiple functions to deliver value to the customer, i.e., the Warfighter. Processes may flow through several different functional organizations, but to be competitive in today's environment requires that each business process have a designated ***business process owner*** who is accountable and responsible for each process as a whole, so that process improvements can be made and measured. Business process improvement has developed its own discipline, with specific methods and techniques (e.g., reengineering), aimed at enhancing the efficiency and effectiveness of processes overall so that customers derive the greatest benefit. These techniques generally aim to streamline the work and information flow so that value-added tasks remain, while non-value added tasks and other forms of waste[2] are eliminated or greatly reduced. The techniques also employ methods to identify defects quickly and trace defects to their root cause so that the source of the problem can be eliminated. These approaches, in turn, require teamwork among employees, and visible information display systems in the work environment that enable employees to detect and respond to defects quickly. These approaches together are known as ***lean processes*** or the lean approach.

Lean approaches (e.g., reengineering) and new information technologies are complementary and mutually reinforcing dimensions of logistics modernization, and they work together to provide benefits to the Warfighter. Lean approaches should be used in conjunction with new technology implementation to transform military logistics – core processes must be made lean even as they are being integrated, and performance will be all the more enhanced as a result. It should be noted that investments in information technology are one key reason why re-engineering has had such an impact on achieving greater efficiency in private sector service industries. Indeed, there are various information technology applications that can support specific aspects of the lean approach to business process improvement[3], eliminating altogether some non-value

[2] Globally benchmarked plants that have implemented lean processes focus on seven types of waste whose elimination is the responsibility of everyone in the plant: corrections-errors, overproduction, material movement, motion, waiting, inventory, processing (do what is necessary, but no more).

[3] For example, Material Requirements Planning (MRP) identifies organizational needs, based on a forecast. Because lead times are a key driver in MRP, it is often believed that MRP brings a "push" philosophy to an organization (i.e., not a streamlined, customer-driven "pull" philosophy, as required in lean approaches). However, it is possible to establish lean-oriented teams that work to reduce lead-time issues and then update MRP parameters to reflect shorter lead times (meaning less non-value added time), in conjunction with streamlining processes toward a true "pull" system.

added aspects of production and overhaul (e.g., bar code readers, RF signals, to provide input to ERP systems).

Private industry's business process reengineering successes and application of innovative information and communications technology to establish new state of the art paradigms for logistics have become benchmarks throughout the world that are widely recognized. The GAO recommended adoption of best business practices, operational methods, and COTS technology to achieve similar results within the DoD. The GAO also demonstrated the necessity for DoD to improve inventory management process and procedures, reduce inventory, reform acquisition policy, improve order cycle times, asset visibility, and on-time delivery. This background suggests an environment in which the Government has focused on an increased involvement of the private sector, business process improvement, and the rapid infusion of enabling technology to augment a loss in organic military support capability since the end of the Cold War. There is a great deal that the DoD can learn from the experience of the private sector in modernizing its logistics business processes.

VI. Enterprise Resource Planning

The process of enabling the vision has already begun with the enterprise integration efforts currently underway within several Miliary Services of the DoD. A number of programs that use commercial Enterprise Resource Planning (ERP) and other tools to develop modern integrated solutions to complex information issues within the DoD's logistics enterprise are in process at the present time. ERP systems are one of the key enablers of the modernized logistics enterprise.

ERP represents a new class of planning and resource management information systems that takes advantage of recent developments in computing technology that have emerged in the late 20th century. The term 'Enterprise Resource Planning' was coined by the Gartner Group in the early 1990s.

ERP grows directly out of ***MRP (Material Requirements Planning)*** and MRPII, through the application of advanced technology such as graphical user interfaces, relational databases, fourth generation languages, computer-aided software engineering tools, and client/server architecture. MRP and MRP II are very important concepts in manufacturing, and without some grasp of them it is not really possible to understand the significance of ERP. As in so many other areas of business, the computer revolutionized modern day planning for manufacturing. This started in the 1960s with MRP – Material Requirements Planning. APICS defines MRP as a set of techniques that uses the bill of materials, inventory data, and the master production schedule to calculate requirements for materials. It makes recommendations to release replenishment orders for material. Further, because it is time phased, it makes recommendations to reschedule open orders when due dates and need dates are not in phase. Time phased MRP begins with the items listed on the master production schedule and determines 1) the quantity of all components and materials needed to fabricate those items and 2) the dates the components and materials are required. Time phased MRP is accomplished by exploding the bill of

materials, adjusting for inventory quantities on hand or on order, and offsetting the net requirements by the appropriate lead times.

Enterprise Resource Planning (ERP) is an evolutionary step beyond MRP and MRP II that enables the further coordination of all aspects of a business through the integration of processes across different functions. It has been compared to the central nervous system of the human body, since it serves as a means of connecting diverse aspects of an organization. The system is built around software support modules for production planning, manufacturing, inventory control, procurement, sales and distribution, finance and accounting, and a host of other functions. Many companies utilize as many as 30 different functional modules, depending on the nature of their business. The key link between ERP and *supply chain management* is the role of a common information architecture that has the capacity to link the enterprise to its customers and suppliers for potentially seamless integration of all key functions, and running the business with one set of numbers.

An ERP system may be conceptualized as consisting of three key elements. First, the foundation of the ERP system is its data, or the information needed to run a business. This takes the form of account numbers, sales orders, inventory, etc. There is one common set of data for the entire company, and it is entered only once, eliminating many sources of error and inconsistency. A second key component of an ERP is its integration capability, which processes, stores and moves the data using a suite of software programs and databases. Integration takes place as programs interact with databases to process, store, and display/collect/move data. Finally, a third component of an ERP system is the specific functionality of its various modules. The specific nature of the processes whereby programs interact with databases to process, store and move data provides the functionality of the business (e.g., manufacturing, procurement, sales, finance).

These technological capabilities have the potential to bring many benefits to business. The system runs in real time, meaning the management has access to up-to-the minute information on the status of operations. Everyone in the company can view the same data, which is a powerful tool for managing performance. ERP is not just a technology, but it embeds a way of doing business that is based on industry best practices, as assessed by the system vendor. This means that the enterprise is strongly encouraged to engage in business process re-engineering (BPR) work in conjunction with the implementation of an ERP; that is, the enterprise should streamline it's data and workflows in conformance with the ERP system, eliminating non-value added activity. BPR is one approach to obtaining lean processes, through which the organization conducts a value chain analysis and then re-designs its business process to eliminate non-value added tasks or activities that are unnecessary, inefficient or wasteful.

Re-definition of data and workflows also provide the enterprise with an opportunity to standardize its business practices across operational sites, and with customers and suppliers as well. Some of the concrete benefits where returns on investment have been realized are in improved order management and more accurate inventory accounting. The overall effect is an enhancement of supply chain management – better integration of

the value chain from supplier through to customer (i.e., the Warfighter), with improved efficiency and effectiveness, and in the long term, positive bottom line impacts.

Since the mid 1990s, ERP has become a 'must have' or a price of entry to retain competitiveness in the global marketplace. Academic research has shown that at least 30,000 firms worldwide now have ERP programs up and running. The majority of these firms run SAP R/3; it is estimated that about 60-70% of firms globally use this product. One study estimated that as much as 75% of the market runs SAP R/3.

Most ERP systems have only been installed in the middle to late 1990s, especially in conjunction with the Y2K phenomenon. Thus, most ERP systems are still relatively new and many firms do not have lengthy track records with these systems. It is not prudent to rely too heavily on the trade press to assess the value of ERP, since this medium thrives on anecdotes that are either very good or very bad. The anecdotes do not provide a balanced and objective viewpoint of industry experience with ERP . Careful, empirical work conducted systematically by dispassionate observers, is still very sparse, with only a handful of studies available, and these studies show mixed results.

For example, we have one empirical study, published by Lorin Hitt and her colleagues in the *Journal of Management Information Systems* (2002), on a population of firms adopting SAP's R/3, compared with a controlled sample of non-adopters. The authors performed a series of statistical tests to determine which population was more robust in terms of business performance measures over time. The tests were not just performed once, but several times, both at the point of SAP adoption, and later, after adoption.

What they found was that the SAP adopters were more successful in generating more revenue per unit of input, and managing inventories and accounts receivable more aggressively. This does NOT mean that SAP caused this behavior, just that firms which are more successful tend to adopt this software, and that they stay more successful after adoption. The kinds of measures that this study examined included sales per employee, profit margins, returns on assets, inventory turnover, asset utilization, and accounts receivable turnover.

The magnitude of effects in the study are relatively large, with marginal changes ranging from 6 to 22% in absolute value. The firms were worth considerably more after adoption (13%), which suggests that the market was rewarding firms for the changes made as a result of adoption – organizational structure, business process redesign, training and education of the workforce, and other assets not captured on the balance sheet.

On the other hand, a Nucleus Research study of SAP clients conducted in 2003 showed that the majority (57%) had excessive customization and consulting costs that detracted from their return on investment. This happens because of the complexity of ERP, and the fact that the systems are generic, but no business is generic, meaning that some customization is inevitable. The nature of the business determines in part how much customization is needed. Businesses that compete on flexibility may need more; those that compete on consistent quality may need less.

What we do know at this point is that ERP is not a fad. It is a fundamental part of the process of technological innovation and the stream of technological innovation leading to enterprise integration. Companies are continuing to spend millions installing it, and it is the best that we have at this point. There are few alternatives if a complex organization wants to apply advanced technology to integrate an enterprise; without using technology, it is very difficult if not outright impossible to integrate a large, complex business such as the DoD.

VII. Organizational Transformation

The business architecture supporting a modernized logistics enterprise will impact and effect change in associated business skills, processes, structures, and even the very culture of the Department of Defense. Activities that have heretofore never considered the impact of their decisions on other DoD logistics activities are now required to do so. This represents the ***organizational transformation*** that is required to realize the logistics enterprise vision for the 21st century. The remainder of this document considers the nature of these changes, and how they can be accomplished within the DoD environment.

Why Is Organizational Transformation Needed?

As we have discussed already, a modernized defense enterprise brings many new capabilities that can greatly enhance the powers of the 21st century Warfighter. Yet, these capabilities cannot be delivered with the human skills, business processes, organizational structures and cultures that were created decades ago, when materiel and information were managed in very different ways. To support the Warfighter's need for the right stuff at the right place and the right time, there is a requirement for transformation in ways of doing business that are compatible with 21st century business processes and technological capabilities and requirements.

This latter statement reflects a fundamental principle underlying ***socio-technical systems (STS) theory***, a framework for understanding relationships between technology and organizations that has been validated by more than fifty years of empirical research in industry. STS theory holds that all work organizations, public and private, are socio-technical systems that combine two elements: the *technical* (including technology, systems, and embedded processes); and the *human or social* (including people, organization, and culture). These two sides are distinctive, with each being explained by different sciences (i.e., the physical/natural sciences for the technical side of the organization, and human/social sciences for the non-technical side). Despite their differences, these two sides are *interdependent*. Neither can accomplish its objectives without interaction between them[4]. They work together, and the nature of their interaction determines how efficient and effective an organization can become.

[4]As an illustration, one can think about soldiers and their weapons. Both are needed to engage in effective combat over the long term. If either soldiers or their weapons were to be removed from the picture, or if one were to not 'fit' the other (i.e., soldiers not trained to use weapons, or weapons made without human factors design), the capacity to engage in combat effectively would be constrained.

Because the two sides form an interacting system, major change on one side requires changes on the other side; e.g., if ERP is introduced, personnel need new skills and roles, the organization needs to re-engineer its business processes, and everyone needs to learn to run the business in new ways. Purchasing and installing a new software system (i.e., technical change) does not automatically guarantee changes in people, organization, and culture. These dimensions have to be changed through careful planning and execution by the people inside the organization. Such changes require many individuals to embrace new ways of thinking, working, and even living on a daily basis – no small matter.

How significant is the human and organizational side of a major technological change effort? In a survey of CEOs who had recently implemented ERP, 73% identified culture and organization factors as the riskiest (high or very high risk), compared to 41% identifying business and process factors as carrying an equivalent risk, and 27% identifying the same level of risk for technology and systems factors (the responses were not mutually exclusive). One way to interpret this survey is to note that companies invest most of their energy and resources in managing or eliminating technological and business process risks, and thus these cause relatively fewer problems during implementation. Unfortunately, relatively little is invested on the cultural and organizational risks, and therefore these unmanaged risks cause the most serious difficulties.

It is important to realize that the human and social dimensions of the organization have developed in *alignment with the technical systems of the past*, and a lag in their responsiveness to a new technical system can place a serious drag on the productivity of the enterprise if a conscious effort is not made to change them as well. Effective implementation of the vision for logistics modernization (oftentimes, a new technical system) requires that we systematically approach the people, organization, and culture with an aim both to understand their current state, and to plan for changes that can optimize the fit between the technical and human/social components. These changes are a critical element of the transformation that is needed to realize our vision for logistics modernization.

Organizational transformation must consider two time frames – the short term, when new technical systems are first being introduced, and the long term, when the organization as a whole must learn to use these new technical systems to its best advantage. There are significant transformation challenges affecting people, organization and culture in both of these time frames. In the short term, the issues involve helping people to understand and to cope with the challenge of *a new work environment* involving a new language and different way of thinking, new work practices, and new work tools. In the long term, the challenge involves *transforming the way business gets done* in the organization, which involves new ways of structuring business processes and managing information to achieve goals. Ultimately, it is the long term transformation that is more difficult to achieve, even through the short term change may seem more challenging initially.

In the sections of this document that follow, we consider both short and long term challenges. First, we describe some of the human issues involved in the transition to an

integrated technical environment, to better manage expectations in the short term. Then, we introduce the concepts and principles of ***organizational change management***, a suite of methodologies that are designed to support transformation over both time frames.

Managing Change in a Socio-Technical System:
Expectations about New Technology in the Short Term

A detailed discussion of technical change management is beyond the scope of this document. There is one aspect of technical change that will be considered, however – human expectations about new technology, particularly Enterprise Resource Planning (ERP), a key enabler of the modernized, integrated defense enterprise. Although ERP is not the only new technology that supports logistics modernization, it is frequently a core component of a modernized information environment, and one that many Military Services have chosen to implement. Because ERP differs significantly from other types of information systems that have been implemented within the DoD in the past, it is important to set expectations accurately regarding this particular type of technology.

Frequently, the arrival of a major new technology program is accompanied by a great deal of publicity and fanfare, complete with high expectations that implementation will bring about great improvements in performance almost immediately. While the potential of ERP is great over the long term, it is crucial to recognize that implementation brings serious challenges that can make the transition difficult and even painful in the short term. If people are expecting a smooth, 'turn-key' installation and instead they are confronted by a significant bump in the road, the psychological impact can be very negative. The purpose of this section of the document is to set expectations more realistically regarding the transition to enterprise integration through ERP implementation, so that management and users can be aware and better prepared for the road ahead. Once aware, there are ***organizational change management*** methods (described later on) that can help to prepare the organization for on-coming change.

Although ERP is relatively new compared to many other types of information systems, industry has developed a body of knowledge about what to expect when an ERP is implemented, and sufficient numbers of DoD organizations now have installed their own ERPs, to validate this experience. Implementing ERP to achieve logistics modernization is a major organizational endeavor, both in the short term and in the long run. In the short term, it is necessary to cope with the stresses of the conversion from the legacy systems to the new enterprise system, and to weather the turbulence of the go-live transition. In the long term, it is necessary to transform the organization so that the benefits of ERP can be brought to bear in order to achieve the vision of logistics modernization. In the next sections of this document, we explore both the short term and long term challenges: first, the turbulent go-live transition, and second, the long-term task of organizational transformation.

Productivity Dip After the Go-Live Transition

The many benefits of logistics modernization do not come without a cost. For the Department of Defense, a large part of that cost involves conversion from legacy systems to new information systems provided by private sector vendors and system integrators (i.e., technology-oriented consulting firms that support implementation of COTS). This conversion is not as simple as installing a new computer system, due to the fact that the Government has been running its own proprietary logistics information systems for the past two to three decades, and it has developed its own business processes and language to reflect these systems. The private sector, on the other hand, has traveled a different pathway, and its logistics systems have evolved through MRP, MRP II, and now ERP and ERP II. These systems, in turn, reflect private sector business processes and language that are very different from those in the DoD. Initially, it may even be difficult for people from these two different 'worlds' literally to communicate with and understand each other, and a major effort is required of everyone to make the leap from Government proprietary to COTS systems.

The 'go-live' transition to ERP may be the single most difficult aspect of achieving the vision of logistics modernization. ***'Go-live'***, also known as cut-over, is the specific point in time when the organization switches from its legacy system to the new ERP system, and the ERP becomes operational. This one step embeds a significant paradox that must be faced by all organizations striving to achieve enterprise integration. The paradox has three aspects. First, bringing an ERP on line is very hard work. Any ERP requires learning a whole new way of dealing with supply and demand fundamentals (e.g., what approach will be used to model demand statistically, for what items, at what times?), it requires re-design of business processes and rules (e.g., who should be building bills of materials and routes?; who will be allowed access to the material master for purposes of making changes in the database?), and it also requires that everyone learn to speak a new language (e.g., SAP-speak terms, such as R/3, APO, MRP, BW, ZSBDO). When all is said and done, the Military Services of the DoD will have to change their cultures in order to do ERP effectively (e.g., changing basic norms and values related to sharing information, reaction times, and teamwork across boundaries). The second aspect of the paradox is that ERP is a 'do it yourself' project. While private sector service providers (system integrators, contractors) can provide invaluable guidance and support to get the ERP up and running, only the people inside the DoD know enough about defense logistics business processes to have any hope of re-designing and managing them in ways that take advantage of an ERP's capabilities. So, insiders have to do the heavy lifting. And, the third aspect of the paradox, this work will never be the top priority in the Department of Defense, where our nation's security and soldier's lives are at stake. Taking care of the Warfighter is Job One, but we still have to do the other hard work at the same time. So, Catch 22 – it's a paradox that cannot really be resolved except by going through a difficult and sometimes painful transition. But that transition is temporary.

In part because of the paradox just described, and in part for other reasons, it is normal for organizations to experience a productivity dip after go-live. The normal level of production falls off, with the amount differing in each organization. In a 2001 Conference Board survey, it was found that 75% of responding companies experienced a

moderate to severe productivity dip, 24% reported no dip, 25% reported a dip lasting one year, and more than 50% reported a dip of less than six months.

The reason for the dip is not only the paradox mentioned earlier, but also the result of other things that are going on after the go-live event. Immediately after go-live, there is a stabilization or 'tuning' period during which the new ERP system is being adjusted to fit the organization, and vice versa. No matter how much testing is done, there are always some glitches when a new system begins to work in a real production environment with real data, real infrastructure, and a real workforce. For example, during this time, there will be:

•Discovery of some bugs that always crop up regardless of how much testing is done;
•Data conversion issues; e.g., wrong part numbers, vendor numbers or inventory numbers are discovered and must be corrected;
•Process bottlenecks that must be corrected; e.g., new places where data is being entered, or where there are linkages to legacy systems;
•Implementation compromises that have to be addressed; e.g., short cuts that were taken due to budget pressure may cause unexpected issues;
• Documentation and training issues; it usually takes users 6 months to feel totally comfortable with the new regime; and
•A need for linkages, upgrades and extensions, which take time to develop and implement.

Sometimes these stabilization issues are lumped together under a general term called 'RICE' – reports, interfaces, conversions, and extensions – these are the major technical activities that often take up the most time after go-live and may delay stabilization and the immediate recovery of productivity. Another term in the slang of computer consultants – 'RICE bowls' – suggests that the effort to create interfaces between legacy systems and the ERP system can reflect organizational turf issues that also have an impact on stabilization. In the traditional organizational environment, stovepiped units each have their own information systems and their own report formats. Trying to connect an ERP to these multiple stovepipes (RICE bowls) through interfaces can be very challenging, and a time consuming experience. Organizations may attempt to protect their control over their own systems and resist efforts by others to gain influence in the way information is managed.

All of this affects productivity, and has a direct impact on the quality of people's work life and their job performance. With a complex new system, some employees may feel as if they have lost their previous job knowledge and competency, and with it their confidence. Some may feel frustrated that it is taking them longer to do their job, or that they can no longer do what they used to be able to do. All of this is normal. Many people will have to learn to do their jobs in a new way. For some, the job will be easier, for some it will be more difficult. ERP is an 'information hungry' system – it needs and demands information in order to do what it was designed to do. This means that some people will have to input more information and that everyone will have to be more disciplined about information. An ERP does not tolerate many errors in data, as legacy

systems may tolerate such errors. In an integrated system, one small error will reverberate throughout the organization, causing errors in multiple locations, corrupting the system and greatly reducing return on investment. Since the whole point of an ERP is to run the organization with one set of accurate numbers, the proliferation of errors is strongly advised against. No one can take sloppy or erroneous information for granted anymore, and many people will have to change the way they work in order to accommodate this fact.

The foregoing discussion raises the subject of 'resistance to change'. Resistance to change means that some people -- including not only computer users, but also supervisors, managers, and even some top managers -- may perceive that technological change is not in their own best interest, or not in the best interest of their organizational unit, and because of this perception they may resist, or work against the change process, either overtly or covertly. It has been said that 'perception is reality', so for those who are resisting, the problems they perceive are real and their resistance may grow from a strong belief that they or their organization will be harmed by the changes that are underway. And, to be quite frank, they may be right. Not everyone is advantaged by the changes described in this document. Some individual employees may find that their jobs are more difficult, at least in the near term. Some supervisors may find that their unit's productivity is reduced, either temporarily or perhaps longer. Managers may discover that they no longer know how to provide oversight to their employees, and that they have to learn new skills. Not everyone will be thrilled with these changes. But, as difficult as they are, the changes are meant to give the best advantage to *defense logistics enterprise as a whole over the long term*. We must try to minimize the disadvantages to individuals and units in every instance, and ways to do this are discussed later in the document, but we also must be honest that those disadvantages cannot always be taken to zero.

It is important to be honest with people about the consequences of an ERP. It may be that some people find the whole thing to be too much to cope with, and for them, it may be time to move on. That can be a good thing, as a transition in demographics can support organizational change, as we will discuss below. Others may find the challenge exhilarating, and may jump right in and love it. This is a major innovation, and different personalities will react differently. It is expected that there will be a spike in retirements and transfers during the time when an ERP is implemented. Be prepared to bring in younger and more junior people who can cope with complex information systems. And be prepared to partner new employees with more seasoned veterans who know the business. Such partnerships between junior and senior employees can be an excellent means to weather the transition.

Recovery After Stabilization

Following stabilization of an ERP, there is a recovery period, until productivity with the new system is about equal to what it was with the legacy system. However, this recovery does not represent all that ERP can do. With well-trained and motivated people (plus management that knows how to manage using an ERP), productivity should continue to

improve, until it surpasses what was possible with the legacy system. This assumes, of course, that the technology is functioning properly.

For many organizations, the recovery time is less than six months, and then there are varying lengths to full productivity under an ERP. But this depends on the scope and complexity of the implementation, and how much the system had to be customized as a result of factors unique to the business. Due to the complexity of technologies and organizational structures within the Department of Defense, longer times to full recovery of productivity are not unusual.

The MRP pioneer Oliver Wight initially developed a classification system to describe different levels of results companies achieved with MRP, and this typology now is being used to describe ERP results as well. Different companies that install the same ERP system may achieve very different business results with their systems, depending on how they implement and use the system. The following describes Wight's four classes of business results:

Class D – The system is implemented and running, but there are virtually no measurable improvements anywhere that matter. This is usually considered a failure. However, it is not a computer failure – it's a failure of implementation, which involves non-technical factors.

Class C -- The company has achieved a good return on investment through reduction of inventories and better management of engineering changes. But the way the company is run has not changed.

Class B – Here there are dramatic changes in many performance categories, including on-time delivery to customers, reduction of shortages in plants, less unplanned overtime, and reduced inventory.

Class A – All of Class B and more. The firm is managed with one consistent set of numbers for the whole company, from top management, through operations, to customers and suppliers. They make extensive use of simulation, doing what-if analysis from the ERP database, in both units and dollars.

What makes the difference between companies whose results fall into these various classes? The answer is based not on technology, but on how implementation and post-implementation activity is managed. That is the subject we turn to next.

VIII. Organizational Change Management

How can we ensure that an organization both survives the go-live period to achieve full recovery of productivity, and accomplishes transformation so that higher levels of performance are realized over the long term? To answer this question, we turn to the discipline of organizational change management, an interdisciplinary field that is founded upon empirical research and practice in a wide range of work organizations.

Organizational change management (OCM) may be defined as the planning and execution of actions aimed at facilitating the implementation of changes in socio-technical systems, with an emphasis on changes on the human or social side of the organization. OCM may be distinguished from *technical change management*, which involves program management activity focused on technology, systems, and embedded process change. *OCM, on the other hand, focuses on the human, organizational, and cultural dimensions of change*, and should be conducted in parallel and coordinated with technical change, due to interdependency between the technical and human components.

Research on socio-technical systems illustrates the importance of *technical system functionality* as a prerequisite to effective change management. If the technical systems that are being implemented are not functioning properly, then the effects of technical dysfunction on the human side are likely to trump the organizational change management activity. Technical functionality must be addressed as a first consideration. However, this does not mean that organizational change management activity should wait until the technical system is working perfectly. In fact, in an integrated environment, the technical system will never 'work perfectly' if the human side is not fully engaged. People need to embrace the new work environment and learn how to use new tools in order to help support improvement of the system as it is being stabilized, and to gain advantages from technological capabilities over the long term. Organizational change management methods are designed to support the capacity of the organization to absorb technical change and make adjustments on the human side that are required by new technical systems; they also can identify and leverage the organization's existing resources as a means to strengthen and facilitate the technical change.

OCM is a process involving several phases, including: 1) an organizational readiness assessment; 2) planning and implementation of key elements of OCM activities; and 3) assessment of OCM activities and continuous improvement. We will discuss the rationale and substance of each of these phases in the following sections.

Phase I: Organizational assessment. Before implementing major change in any organization, it is crucial to assess the organization's ***readiness for change***, which begins with an analysis of the organization's current or 'as-is' state. A readiness for change assessment gives an indication of those factors in the organization that will support the vision for change (forces for change), and those that may pose impediments to change (forces against change). In OCM, the *forces for change* are used to facilitate the change process, while *forces against change* are reduced, eliminated or managed to neutralize their effects.

Readiness assessment begins with an understanding of the requirements of the vision or 'to-be' state (i.e., logistics modernization and enterprise integration), and then compares these requirements with the existing conditions in the organization's 'as-is' state, identifying both alignments (we will call these 'resources'; they are the forces for change) and non-alignments (we will call these 'risks' or 'gaps'; they are the forces against change). This assessment can become a blueprint for actions that need to be made in the second phase of the OCM process.

The readiness assessment has two parts. **Part I** focuses on alignments and non-alignments related to *people, organization, and culture* as these pertain to our vision for logistics modernization. People, organization and culture are critical contextual factors in the background of the organization that cannot be changed quickly, but will have a serious impact on technical change efforts. In this first part of the assessment, we conduct a comparison of the 'as-is' and 'to-be' states for key factors related to[5]:

- *People* – defined as demographic characteristics, specific knowledge/skills/abilities, and attitudes and perceptions with respect to our vision for logistics modernization and its enabling technologies:
  - *Examples –*
  - *Demographic profile of the workforce*
  - *Computer literacy of the workforce*
  - *Awareness of the need for change*
  - *Perceptions of new technology*
  - *User self-assessments of readiness*
- *Organization* – associated job roles and reporting relationships, the system of incentives and disincentives required to facilitate the vision:
  - *Examples –*
  - *Mechanisms for horizontal coordination (e.g., teams)*
  - *Mechanisms for vertical coordination (e.g., labor/mgt. relations)*
  - *Rewards and incentive systems*
  - *Roles and units to support learning and change*
- *Culture* -- informal shared patterns of values, norms, beliefs, and behavioral practices to achieve the vision of a modern logistics enterprise:
  - *Examples –*
  - *Data accuracy and discipline*
  - *Technological innovativeness*
  - *Boundary trust relations*
  - *Learning organization*
  - *Voice and inclusiveness*

It is important not to focus only on the non-alignments or gaps that exist, but also to emphasize areas in which the organization has resources or strengths (alignments) that can support the vision. These ***resources*** (forces for change) should be built into the next phase of OCM. For example, an integrated enterprise requires that personnel understand that their work can impact the work of others in the organization. If employees have had extensive experience working on cross-functional teams, and understand the concept of process flow that places their individual jobs within a sequence of activities that includes upstream and downstream relationships, then there is a good chance that they are ready to embrace a culture of interdependency that is required in a modernized enterprise. This

[5] Please note that each factor is followed by examples that are illustrative only, not definitive. There may be other key factors depending upon the exact nature of the change being proposed, and the organizational context.

resource can be tapped for many purposes, including redesign of integrated business processes and group-oriented training exercises.

Significant gaps (non-alignments or forces against change) between the requirements of the 'to-be' and 'as-is' states represent ***risks*** that need to be addressed prior to the go-live event, and they also should be built into the next phase of OCM. For example, if personnel are not highly computer literate, then (depending on their job role) it may be necessary to identify someone in the work group to enter data for them, and/or to begin a program to upgrade the computer skills of some of the employees. Or, if there are a large number of key employees who are very close to retirement age, it might be a good idea to create a succession plan early on, including migration of selected job roles to accommodate new business processes and technologies.

While people, organization, and culture cannot be changed overnight, it is critical that we understand the resources and risks that reside within these dimensions of the organization so that we can do an effective job of managing them. Major change in complex organizations is in part a chaotic process that cannot be completely controlled, so the key theme here is to manage and to cope, but not to attempt to over-control.

This brings us to **Part II** of the readiness assessment, which pertains to elements within the organization that are needed to conduct the organizational change management activity itself. OCM relies upon *six key elements that provide an overall framework for change*. The six elements include: ***leadership; communication; organizational evolution; participation; education and training; and resistance management*** (described in detail below). These six elements of organizational change management do not form an integrated theory of change; no such theory exists that has widespread acceptance. The six elements are areas of managerial action that have been found to enhance the effectiveness of change efforts, although none of them are guaranteed to deliver a positive result in every case (i.e., this is not physics). But when used together, the six elements create a powerful, mutually reinforcing field for the support of organizational change that is compelling and attractive. Generally speaking, we use the six elements of change to help leverage the resources and mitigate the risks we have identified in Phase I, as a means to prepare the organization for socio-technical change.

However, we can only rely upon these six OCM elements to the extent that they exist within the organization, and to the extent that they are ready to be used to support change. So, the second part of the readiness assessment involves a review of these OCM elements to determine whether or not they are in place, and are in a condition to support change. If these elements are not in place, or are not ready to support change, they must be established first. The next section of the document describes the six OCM elements and relates them to change in the technical system.

Phase II: Planning and Implementing Key Elements of OCM. Organizational transformation is facilitated by six elements of organizational change management that are described below. When implemented in concert, these elements improve the chances that a transformation initiative will meet its goals. These elements are used to *actively*

manage change – to facilitate change 'on the ground', so to speak. Thus, if our organization faces specific risks in the implementation of ERP or any other aspect of logistics modernization , these six OCM elements can be very useful in helping us to reduce, eliminate, and/or manage these risks. These elements also can draw upon organizational resources to strengthen change processes.

OCM Element #1: Leadership. In organizational transformation, leadership is crucial because the organization is moving into the unknown, where there is much uncertainty, risk, and potential danger. Difficult times lie ahead. The transformation to an integrated logistics enterprise is no easy matter and there will be plenty of resistance along the way. Leaders are needed to show the way forward, to remind everyone of why we are doing this, to solve problems and remove roadblocks, and to bring new resources to bear where they are needed. Without leadership, the barriers to change may prove too difficult to surmount, and transformation may not happen.

Leaders are people at all levels in the organization who see the way forward and help to show others the way. They articulate the vision for the future in a way that is compelling and attractive, and explain why the vision is necessary for the organization and individuals to embrace. When the going gets tough, the leadership stays the course, providing encouragement, listening to people's problems, providing consistent support to help solve problems, and inspiring courage not to give up. When bad news needs to be given, leaders are honest in providing it; leaders can be trusted to tell the truth, even when that truth is painful. At the most advanced levels of leadership, the leader is someone's whose energy and efforts are directed at advancing the organization's overall interests for the long term, not his or her personal interests, and/or his or her subunit's interests. The best leader is a long-term institution builder, one who works with other leaders to build something that lasts.

The strongest leadership is provided when leaders throughout the organization are aligned around a consistent message for change, up and down the chain of command and across all organizational units. This can be a difficult goal to achieve, but it is certainly a goal to strive towards. The likelihood of successful outcomes is increased as the alignment of leadership is increased. Leadership should be distinguished from sponsorship and from champions. ***Sponsors*** and ***champions*** also are very important to transformation efforts. They are typically higher-level managers who take responsibility for oversight and support of a transformation initiative Sponsors and champions also may be leaders, as described above. Leaders, however, do not need to be higher-level mangers; leaders can be located anywhere in the organization, and are distinguished by their hands-on approach to change – they are in contact with the field (i.e., employees, technology users, working managers), and work with others side-by-side on a daily basis to make change happen 'on the ground'.

Transformation to a modernized enterprise will be facilitated by:

- Leaders at all levels, including middle managers, supervisions, and others, who are informed and aligned around a common vision for the future state of the enterprise;

- Leaders at all levels who can articulate this vision, explain what is at stake, why people should want to be involved;
- Leaders who remain visible, stay focused and in contact with the field during the entire transition, listening to problems, and responding actively to these problems, as well as working to solve them;
- Leaders who are collaborative, working as team members with other leaders, sponsors, and champions to solve problems jointly across organizational boundaries, based on open sharing of information, and mutual respect and trust;
- Leaders who hold their direct reports accountable, according to these principles;
- Leaders work toward the long-term interests of the overall institution, not their personal interests or those of their subunit.

OCM Element #2: Communication. Logistics modernization incorporates several ***innovations*** within the US military – something new within its context. Research on the process by which individuals gradually 'buy into' new ideas or technologies show that there are several stages that occur, beginning with *awareness* of the innovation, then *persuasion* (this is a good idea), followed by *buy-in* (making a decision to adopt the innovation), *commitment* (implementation), and finally *confirmation* (over time, deciding that the first decision was the right one). Clearly, this is a complex process that takes time.

The process by which innovations are accepted by people (and therefore diffuse successfully through a population) depends upon effective ***communication*** processes at each stage. People are persuaded and make decisions about accepting innovations on the basis of what they hear and learn about the innovation from others. At the earliest stage of awareness, they are influenced by mass media such as newsletters, educational seminars, and meetings that provide basic information to build awareness and understanding. At the persuasion and buy-in stages, however, they are more likely to listen to ***opinion leaders***, people who are respected for their knowledge related to a particular domain such as work or business. Opinion leaders may include those who have experience with the innovation, such as ***early adopters*** or ***expert users*** of a new technology.

It is also important to note that different kinds of communication channels will be important at different stages in the buy-in process. The channels may be formal (i.e., planned) or informal (i.e., spontaneous). At the persuasion stage, there is probably nothing more effective than the respected opinion leader. But at the buy-in stage, communication that enables active participation of the individual will be most effective (i.e., two way communication, where the individual can comment and receive an active response). That's because people may have issues or questions that need to be addressed before buy-in takes place; the more complex the innovation, the greater the need for two-way communication. Later on, at the commitment and confirmation stages, communication that allows the individual to 'talk back' and be heard and responded to also will keep communication strong and contribute to success.

If a formal communications program is not established, then an informal one will grow up spontaneously, as people on the ground struggle to make sense of what is happening around them. 'Out of control' communications usually mean that rumors rule, and this can be a serious force against change, especially if the transformation effort runs into difficulty, as most do at one time or another. It is important to have a communication program in place to explain problems honestly and openly, so that overly negative rumors do not damage the effort.

Transformation to an modernized enterprise will be facilitated by:

- A formal (planned) communications program that spans each of the stages of the innovation buy-in process, from awareness through confirmation – communication should not stop at a given event (e.g., go-live), but should continue at least through stabilization and beyond;
- Communications programs should make use of multiple channels, including opinion leaders, as well as mass media channels;
- Communications programs need to provide information in both a 'top-down' format (program to people, providing information on program status) as well as 'bottom-up and two-way' format (people to program, allowing for questions and comments, with dynamic response capability – could be web-enabled);
- Communications programs may exist at two coordinated levels – transformation program level, and field site level, allowing for customization to local people's interests.

OCM Element #3: Organizational Evolution. To enable a modernized enterprise, our 20th century organizations must evolve into 21st century ones. Tall vertical stovepipes must gradually transform to support horizontally integrated supply chains that are organized around value-added tasks and activities. There is no magic formula to make this happen; it is a gradual process of planning and execution by teams of people with business and technological knowledge. Lean processes and ***business process re-engineering*** (BPR) are disciplines that enables the transformation to take place. Lean processes and BPR can streamline work and information flow across organizational units, eliminating non-value added activity and enhancing efficiency. Generally, it is advised that these activities be conducted in conjunction with the implementation of new technology, so that we don't 'pave the cowpath' as Mike Hammer said. Conducting BPR in conjunction with implementation also enables the organization to take advantage of best practices built into ERP by the vendor, and minimizes the need for expensive software customization that is known to reduce return on investment.

Lean processes and BPR bring with them and require systematic review and possible redesign of: *organizational structures* (job roles, reporting relationships, incentive/disincentive systems) to better align with new process and technology requirements; *job descriptions* to ensure that necessary skill requirements are being met with new hires; *performance targets and metrics* linked to goals and plans of specific units, to ensure that they are drivers of an integrated organization; *special roles or units* to support the transformation, such as transformation leaders or teams, expert user cells, business process owners, change agent networks and forums; *special processes* to bridge

communication gaps in the organization, such as team meetings to facilitate communications at 'organizational seam points' where previously there were two or more separate units and information systems, and now information is expected to flow 'seamlessly' across the boundary.

Transformation to a modernized will be facilitated by:

- Implementing lean processes and business process re-engineering to enable most efficient information and work flow across supply chains, and to take advantage of capabilities embedded in COTS;
- Systematically reviewing and possibly redesigning job roles, reporting relationships and incentive/disincentive systems to ensure appropriate alignment with requirements of modernized logistics vision and enabling technology;
- Systematically reviewing and possibly redesigning performance metrics and targets linked to goals and plans of specific units to ensure that they are drivers of an integrated organization;
- Establishing special roles, units, and communication processes to support the transformation effort.

OCM Element #4: Participation. Earlier, in the communications section, it was noted that buy-in and commitment are facilitated when people are allowed to raise questions and receive responses as part of a dynamic communications process. Similarly, the greater the degree of ***participation***, involvement or engagement an individual has with an activity, the more likely it is that he or she will experience a sense of ownership with respect to that activity, due to the fact that real participation (where a person's input is acted upon in a genuine sense, whether this means providing an honest response, or revising a program in response to valid criticism) makes the individual an owner. Ownership, in turn, facilitates buy-in, meaning acceptance of the activity as legitimate and worthwhile for the organization. Another benefit of participation is that people are more likely to give their best ideas to an effort in which they feel some ownership. Participation thus enhances the quality of enterprise integration, as individuals' knowledge and expertise is voluntarily contributed to the activity.

It is important to increase the number of people who are actively participating in logistics modernization, since this will speed up the process by which the innovation diffuses across the population of the DoD. As more and more people buy into the innovation, they will help spread the word and convince others, who in turn will influence their peers. Ultimately, a critical mass will be achieved and the innovation will 'stick'. Participation accelerates the diffusion curve.

There are many ways in which individuals can participate in logistics modernization. To a certain extent, everyone 'participates' just by coming to work, but we are talking about something beyond this passive form of 'participation'. In this context, participation is an act that goes beyond the minimum passive role of holding a job and it means a voluntary action to reach out and do something with respect to the transformation effort. That something may be a critical comment, or it may be a question. Those are forms of participation that require a response. Other kinds of participation could involve attending

a users' meeting or a demonstration to learn more about a new technology, or offering to help someone with a job task pertaining to logistics modernization, or volunteering to help with a newsletter related to enterprise integration. When someone takes an action of this kind, they are stepping forward and saying 'I'm interested'. The transformation program should be prepared to respond positively by engaging such individuals – reach out and involve them on a more systematic basis.

Another way to encourage and support involvement is to recognize and reward individuals who provide outstanding service to enterprise integration efforts. There is no question that successful transformation will require extraordinary contributions from many people. Recognizing and rewarding them, whether formally or informally, should become an integral component of the organization's regular incentive program. Honoring these individuals for their contributions and establishing their behavior as exemplary also can become a means to encourage involvement from others.

Transformation to a modernized enterprise will be facilitated by:

- Establishing ways and means to engage increasing numbers of individuals in active participation in the transformation effort;
- Developing mechanisms to enable individuals to contribute their ideas, knowledge and expertise to enhance the quality of the effort;
- Establishment or expansion of recognition and reward programs to honor employees who provide outstanding contributions to logistics modernization and enterprise integration.

OCM Element #5: Education and Training. Any transformation effort that involves a significant new technology investment such as ERP is likely to include a training program for employees. Typically, such programs advance understanding through a series of levels, from general high level knowledge of the system overall, to more specific in-depth knowledge of particular job functions. It is important to bear in mind that our goal in training is not only to teach employees to perform specific transactions to support their job function, but also to provide them with sufficient knowledge and understanding that will enable them to be active players in a new kind of organizational environment – an integrated logistics enterprise. This takes more than transactional training (sometimes called the 'ERP hokey pokey') – it takes a ***learning organization*** approach.

A learning organization approach is one in which the entire organization supports learning about the transformation to enterprise integration. The important point is that our goal is to achieve an integrated enterprise, not just implement new technology. If employees don't know how to use the technology to achieve the vision, then we have failed. We need to keep our eye on the ball. A key point to remember about enterprise integration is that enterprise systems are so complex that no one knows exactly what they can do when they are first installed. It is necessary for people to learn how they work at a given installation site, and with this learning, their capability for high performance emerges over time. This emergent capability depends on *the learning of an entire human community* – the entire group has to engage with the system to discover how it functions, to debug it, and to improve its operation. It is not possible to force a work group to learn.

Indeed, force may cause the opposite reaction – resistance -- and resistance can lead to lack of learning. If people choose not to learn how to use the system, then its dysfunction has the capacity to shut the organization down and render it inoperative. Alternatively, resistance can lead to permanent suboptimization, which is less dramatic than failure, but may be just as costly.

To ensure that we have a learning organization approach that will enable the entire human community to learn the system together, there are several requirements that need to be fulfilled. We need to ensure that *learning* actually is taking place in each and every class, not just that someone attended training and went through the motions. Thus, we need ways to assess whether or not someone learned from training. Learning can be better assured if the content of training maps on to actual job functions, and if job-relevant knowledge increases as a result of training. We also need to assure that examples from actual work are used in training, that there are opportunities to practice new skills, that there is on-the-job support and documentation after training, and that the timing of training coincides with the deployment of new technology.

Users of new technology should understand not only their own job-related functions, but also the work process flow upstream and downstream from their positions, so that they can conceptualize the logic underlying the system. This will help them in trouble-shooting problems once they become more proficient. Thus, their education should include training on business processes as well as transactions.

There should be a provision for management education as well. Frequently, managers and supervisors do not understand how the new system works, and they rely on users to provide them with the information they need to manage. This approach will not take the organization to the Class A status described by Oliver Wight. A truly integrated enterprise requires that managers understand how to run an integrated enterprise – how to use the new tools to run the business in new ways. Users can help managers with some of this knowledge, but managers need their own educational program to develop a management level view that is specific to their perspective.

The transition to modernized logistics is one that takes several years, and learning the capabilities of the new system is not a trivial task. Most organizations rely on a cadre of early adopters and expert users to help them 'anchor' new technology and transfer knowledge and skills to the user population. It is very important to select the right people for these roles, and to organize them properly. Best practice suggests that highly motivated and capable individuals should be selected as early adopters and expert users; anything less risks the future of the DoD. These individuals should be assigned full time to their new roles, and not be expected to continue in their previous assignment as well. An organization should be established to provide support for early adopters and expert users; they need to be able to form a team or a cell in which they can provide mutual support to each other, but they also need to be able to link up with other users to that they can transfer knowledge to them. There are many important services that early adopters and expert users can provide, including creation of documentation for desk side job aids, group training for users and supervisors, technical troubleshooting and problem solving,

and support for work process re-design. They also can be provided with opportunities for advanced training in supply chain management and ERP outside the DoD so that their expertise is enhanced.

Over time, the technological suite that supports enterprise integration will continue to evolve. This is one of the reasons that the DoD decided to implement a COTS solution – to stay current with evolving technology. This means that there will be periodic deployments of technical upgrades, and a need for additional training. Experience from industry suggests that major upgrades can cause productivity dips that resemble the initial dip following the go-live event. The best way to minimize this dip is with additional rounds of training for the workforce. Re-training also will be needed when there are major process changes or waves of attrition.

Transformation to a modernized enterprise will be facilitated by:

- Training that focuses on *learning*, not merely transactional 'hokey pokey';
- Implementation of quality education principles, including training that uses job-related examples, allows time for practice, and is supported by detailed job aids;
- Education specifically designed for management as well as technology users;
- Full time roles for early adopters and expert users, including means to support them and to enable them to transfer knowledge to other users; and
- Additional rounds of training for technology upgrades, major process changes and attrition.

OCM Element #6: Resistance Management. When individuals in positions of authority work against transformation, either openly or behind the scenes, then we face a serious force against change. Such individuals can mobilize or encourage others to resist and can create roadblocks that are difficult to overcome. For example, if resistance is mounted by a manager or supervisor, he or she can make it difficult for employees to receive training, or can block the assignment of individuals to roles as expert users. Such resistance is not unusual. It simply means that transformation has been interpreted as running against someone's interests, either actual or perceived.

It is not accurate to characterize all resistance as negative; it can play a constructive role as well. Sometimes those who resist have good reasons, and they always should be given a fair hearing. If the resistance is based on sound objections, the issues should be addressed and as a result, the process of change will be strengthened. Sometimes, resistance can be reduced by showing that the resister's negative interpretation is not accurate. Other times, it is possible to offer incentives to lower resistance (or disincentives if resistance continues).

If resistance is based on the accurate perception of disadvantage, it may be possible to work out means to lessen the difficulty. Often, by actively involving those who have something to lose, it is possible to devise alternative approaches or compromises that are more acceptable to the people who are feeling the pain. It is important to try to make this happen whenever possible. Transformation should not make working life more difficult for many people as a rule, otherwise it will not be supported in the long run. Creativity is

required to solve difficult problems, and the best way to come up with creative solutions is to directly involve those that are experiencing the problem. Whatever, do NOT ignore them. This is liable to make matters much worse in the long run.

Because the DoD is a military organization, it is not likely that there will be overt resistance to strategic initiatives that have been identified by top leaders. What is more likely to happen is that resistance will take a more passive aggressive form, and the transformation won't receive much more than very routinized or feeble efforts. Since enterprise integration is a difficult change, such responses invite failure.

In managing change, it is necessary to persuade people to do something differently, and generally they cannot be forced – the agreement has to be voluntary. If it is forced, people will not give their best effort, and best effort is required or we will not reach Class A. Therefore, it is recommended that a continuum of approaches be used to manage resistance when significant actors are involved. This continuum runs from education and communication (this is the easiest remedy with the lowest cost), to participation (as described above), to facilitation and support, to negotiation, to co-optation, to manipulation, to outright coercion (i.e., removing someone from their position of authority). Each of these approaches has its drawbacks; the farther down the continuum one must travel, the greater the penalty. Coercion, for example, is quite risky in that it is difficult to do and might trigger a backlash from others. However, it must be noted that where time is short, it may be necessary to use an approach that has greater force sooner rather than later, and take the consequences as a trade-off.

A final note on military culture is in order. It may be tempting to activate a command and control style by telling people to 'just do it', and even ordering them not to complain or say anything negative in public. This strategy is likely to end the open voicing of negativity, but it is not likely to win anyone over to the transformation effort. What's more worrisome, the negativity could go 'underground' where it is far more difficult to deal with and can be far more damaging. It is better to permit and even encourage open voicing of criticism, where it can be investigated and responded to, so that there is awareness of the issues and where the risks are. This is one of the lessons learned from quality management.

Transformation to a modernized enterprise will be facilitated by:

- Permitting the open expression of issues and concerns, with follow-up investigation and responses to each of these;
- Using resistance as a means to identify weaknesses in transformation efforts, and to strengthen these efforts by addressing the limitations;
- A continuum of approaches to manage resistance, beginning with education and communication, and only very gradually escalating to more forceful approaches that have higher costs, with time pressure acting as a counterweight that sometimes requires trade-offs;
- Encouraging participation from those who stand to be disadvantaged, as a means to encourage creative solutions that can minimize losses;

- Avoidance of a command and control style of silencing criticism that can drive resistance underground where it is more difficult to manage.

Next steps: If an assessment determines that the organization has in place at least some of the elements described above (e.g., supportive and aligned leadership, a communications program, a means to review organizational structures, etc.), then it should be possible to proceed with planning and implementation of OCM activities using the six elements. The general idea here is to manage (leverage/mitigate) each resource and risk identified in Phase I by using one or more of the six action-oriented elements of OCM described above. This is a creative exercise – there is no 'right or wrong answer', although some configurations may be more effective than others. The result should be a *small but significant set of OCM activities* that facilitate the transformation to enterprise integration at a given site. These should be customized, value-added activities that support people in their efforts to transform the organization.

The planning process by which the resources and risks are managed using the six OCM elements should be collaborative, including people representing both the local organization and the transformation program. All should agree that the planned activities will facilitate transformation. Site level leadership should be briefed and agree to the OCM activities that are planned. These activities usually will be executed at the site, with support from the transformation team or office.

If Part II of the readiness assessment determines that the organization does not have in place the basic elements of OCM that are needed to support management of resources and risks identified in Phase I, then it will be necessary to build an infrastructure to put those elements in place. It is recommended that the effort focus on a *small set of high value-added OCM activities that represent each of the elements*, and get those up and running to *establish a basic infrastructure for OCM*. For example, here is a template that could serve as a framework for establishing an initial OCM[6]; these activities were selected because they contribute to the transformation process and support workforce learning:

OCM Elements	*Suggested Activity to Establish OCM Infrastructure*
Leadership	Leadership gives visible attention and support to the transformation effort (e.g., holds weekly meetings to discuss and address key issues; report follow up)

[6] Resistance management should be reduced if all of these five elements are implemented. However, if resistance from significant actors continues, generally it should be handled privately, by leadership. Thus, resistance management is not included in the template. A sixth element could be added to the template that deals with factors unique to the site, if desired.

Communication	Information on the transformation is presented/exchanged in monthly updates to the entire workforce; information is publicized when it becomes available
Org Evolution	A systematic process and new roles/structures are established to facilitate transfer and sharing of knowledge between expert users and other users on ERP
Participation	A systematic process is established to recognize individuals who have distinguished themselves through extraordinary contributions to the transformation
Education/Training	Selected individuals are approved to attend external training programs associated with advanced knowledge of ERP, and receive certification

Once this basic infrastructure has been implemented locally, then the implementation site is ready to move forward with more advanced actions that relate to the management of unique resources and risks, as described previously.

Phase III. Assessment of OCM Activities and Continuous Improvement. To reflect the seriousness of effective organizational change management to the long term success of enterprise integration, it is vital that these efforts be assessed and revised based on feedback from the local implementation sites. An assessment process should be established in collaboration with the local sites, and on-site assessments conducted every quarter or semi-annually. One approach is the scorecard method that uses the OCM elements as a framework in establishing a scorecard, and sets up indicators or metrics that represent tangible evidence of progress on agreed upon OCM activities at the site. Scorecard results should be reported to leadership at the same time technical progress is reported.

The on-site assessment process provides an opportunity to learn about issues or problems that the site has experienced in implementation of OCM activities, which should in turn lead to learning and modification of the approaches that are being used. In addition, when it is clear that the current approaches have fulfilled their purposes and/or outlived their usefulness, the organization should 'push the envelope' by moving forward with more advanced activities under each of the OCM elements. These activities should be determined through an on-going assessment of emerging resources and risks, and a creative, collaborative process that engages everyone who has responsibility for transformation at the site.

Enterprise Integration Toolkit. The Enterprise Integration Toolkit is an electronic resource maintained by the Office of the Deputy Undersecretary of Defense (Logistics and Materiel Readiness). This resource supports many of the OCM activities described above by providing additional discussion and specific methodologies intended to guide users in particular techniques. The tools have emerged from concrete experiences of

organizations in the Department of Defense as they implement enterprise integration initiatives, and thus they are tried and tested in the defense environment. To access the toolkit, go to: **www.eitoolkit.com**.

IX. Conclusion

Realizing the vision for enterprise integration is a major organizational challenge for our age. Some observers have commented that this transformation represents a significant overhaul of the modern organizational form that is taking place across the industrial landscape, shifting corporate structures from their traditional vertical to a more horizontal, process-oriented configuration. If this is accurate, it explains the prolonged period of turbulence that we are experiencing. Nothing so monumental can be accomplished in a short time frame and without dislocation and duress. We must recognize, however, that when such environmental shifts take place, organizations that do not respond dynamically face the possibility of a bleak future. To avoid that fate, we must seize this opportunity to transform our logistics enterprise, and in so doing claim a renewed energy and vigor for the century that lies ahead.

X. Glossary

Business process owner – an individual in an organization, often a manager, who is delegated responsibility for the performance of an overall business process across the entire supply chain.

Business process re-engineering (BPR) -- "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (see Hammer and Champy 1993:32)

Champion/sponsor – usually a high level manager who provides oversight and support for an significant initiative, arguing its case to top leadership of the organization and harboring the initiative within his/her organizational area.

CINCs – Commanders-in-chief

Commercial off the shelf (COTS) –Software that is available for purchase on the open market through a vendor.

Communication -- a process involving a sender and a receiver, in which the sender relays a message to a receiver, who receives it, decodes it, and in turn sends back some form of feedback regarding his or her interpretation of the message.

Early adopter – One of five adopter categories in the diffusion of innovation theory; the early adopter is a respected member of the mainstream population who demonstrates the usability of an innovation to the early majority population.

Electronic commerce – The process of making commercial transactions though the use of the internet, web or electronic data interchange (which use standardized formats).

End-to-end distribution: Provides materiel, including retrograde and associated information from the source of supply to the point of use or disposal as defined by the CINC, Military Service, or characteristics of the commodity, on a worldwide basis. This includes acquisition, sourcing, positioning, and transportation to facilitate the flow of materiel to the end user. It recognizes that deployment and distribution processes need to be synchronized.

Enterprise integration -- Materiel and information flow seamlessly across different functional and organizational units, as if there were no boundaries between them, enabled by advanced information technology and systems architectures.

Enterprise Resource Planning (ERP) -- An enterprise wide software solution that represents an evolutionary step beyond MRP and MRP II that enables the further coordination of all aspects of a business through the integration of functions across business processes.

Expert user – An information system end user who has developed or is in the process of developing specialized skills in operating the system in a specific functional area.

Go-live -- Also known as cut-over, this the specific point in time when the organization switches from its legacy system to the new ERP system, and the ERP becomes operational.

Interoperable – Information systems that have the capacity to directly exchange data without the need for a separate interface mechanism, based upon incorporation of common standards (**check this**).

Leadership – People at all levels in an organization who see the way forward and help to show others the way.

Lean processes -- An approach to business process improvement that strives to transfer the maximum number of tasks and responsibilities to those actually adding value to the focal product or service, thereby eliminating non-value added activities or waste (muda), together with a means for detecting defects quickly that traces problems to their root cause and eliminates them.

Learning organization – An organization with the capacity to change/improve its behavior (performance) based upon experience (i.e., learning). This capacity rests not only on the learning of individuals within the organization, but on policies and routines established by the organization that transcend any given individual.

Logistics enterprise – The entire set of activities, processes, systems, and organizations that together are responsible for the logistics operations of the Military Services of the Department of Defense.

Material Requirements Planning (MRP) -- as a set of techniques that uses the bill of materials, inventory data, and the master production schedule to calculate requirements for materials.

Expanded definition: a method for the effective planning of all resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer 'what if' questions. It is made up of a variety of functions, each linked together: business planning, sales and operations planning, production planning, master production scheduling, material requirements planning, capacity requirements planning, and the execution support systems for capacity and material. Output from these systems is integrated with financial reports such as the business plan, purchase commitment report, shipping budget, and inventory projection in dollars. MRP II is a direct outgrowth and extension of closed loop MRP.

Network centric, or 'net-centric' -- a Warfighter requirement or other support requirement (whether human or automatically generated) is known at once by all potential sources. The systems architecture responds as one to the requirement, providing near real-time feedback to the customer that creates or validates an expectation of service, offering actionable options if the full requirement will not be met.

Opinion leader – An individual respected by a community of practice for his or her knowledge and capability in terms relevant to that community, and someone that others seek out for advice and recommendations.

Organizational change management – A suite of approaches, methodologies and techniques, based upon empirical research and managerial practice that, when implemented together, can reduce risks associated with major organizational change, and increase the likelihood that the goals of change will be accomplished.

Organizational transformation – A significant change in skills, processes, structures and culture of an organization that signal a qualitative shift in the nature of the organization's capabilities (generally, but not necessarily only, in a progressive direction).

Readiness for change -- The extent to which key factors in the organizational context are supportive or conducive to moving forward with the proposed initiative.

Resources – Capabilities or strengths that may be drawn upon to enable pursuit or achievement of goals.

Risks – Things that may go wrong in an uncertain situation, causing unanticipated damage or failure in pursuit of goals.

Socio-technical systems theory – A framework for describing and explaining the relationship between technical and non-technical elements in a work organization, based upon systems theory and the observation that technology and humans are interdependent in achieving organizational performance.

Supply chain management – This encompasses all business practices associated with moving goods from the raw material stage to the end user. The supply chain includes sourcing and acquisition, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. It also embodies the information systems to monitor all activities

Systems architecture -- A description of the systems and interconnections supporting the required enterprise functionality.

XI. Suggestions for further reading :

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